

Application Serial No. 10/045,652

REMARKS

The Applicants and the undersigned thank Examiner Bello for his careful review of the application and especially for his time and consideration given during the telephonic interview conducted on August 4, 2006. A summary of this telephonic interview is provided below.

Claims 1-33 have been rejected by the Examiner. Upon entry of this amendment, claims 1-33 remain pending in this application. The independent claims are Claims 1, 13, 25, and 30.

Consideration of the present application is respectfully requested in light of the above claim amendments to the application, the telephonic interview of August 4, 2006, and in view of the following remarks.

Summary of Telephonic Interview Conducted on August 4, 2006

The Applicants and the undersigned thank Examiner Bello for his time and consideration given during the telephonic interview of August 4, 2006. During this telephonic interview, the Applicants' representative explained that U.S. Patent No. 6,889,007 issued in the name of Wang et al. (hereinafter, the "Wang reference") and U.S. Pat. Application Publication No. 2002/0105965 published in the name of Dravida et al. (hereinafter, the "Dravida reference") do not teach all of the elements recited in a proposed claim amendment that was submitted to the Examiner prior to the telephonic interview.

Specifically, it was pointed out to Examiner Bello that the Wang and Dravida references do not teach a routing device for directing downstream packets in an electrical domain to a plurality of multiplexers, the routing device apportioning bandwidth in the electrical domain between subscribers and using a look-up table for processing the downstream packets and upstream packets.

It was explained to the Examiner that the optical transceivers 228J-N in Figure 2 of the Wang reference in which the Examiner relies on to provide a "routing device" do not operate in the electrical domain. The optical transceivers 228J-N convert electrical signals into optical signals. Applicants' representative further explained that wavelength access controller 204 of the Wang reference also does not apportion bandwidth in the electrical domain between subscribers and that it does not use a look-up table for processing downstream packets and upstream packets. Instead, the wavelength access controller of the Wang reference provides a

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“digital wrapper” that provides per-optical wavelength performance and optical error correction features to a service specific optical signal.

Applicants’ representative also explained that the Dravida reference, especially in Figure 28 that is relied upon by the Examiner in the last Office Action, does not provide any teaching of a routing device. Applicants’ representative also mentioned that the Figure 28 is the conventional art that is mentioned in paragraph [0016] of the Applicants’ published patent application. Figure 28 of the Dravida reference provides a system that polices data at the entry points (upstream direction) of a network. Meanwhile, Applicants’ system polices data at the exit portions (downstream direction) of an optical network.

Examiner Bello acknowledged the Applicants’ discussion of the differences between the claimed invention and the prior art. Examiner Bello agreed to conduct an update search for the claimed invention as amended when a formal amendment is submitted.

The Applicants and the undersigned request Examiner Bello to review this interview summary and to approve it by writing “Interview Record Okay” along with his initials and the date next to the summary in the margin as required by M.P.E.P. § 713.04, page 700-202.

Claim Rejections under 35 U.S.C. § 103(a)

The Examiner rejected Claims 1-2, 4-5, 9-10, 12-21, 24, 25, 27, 30, and 31 under 35 U.S.C. § 103(a) as being unpatentable over the Wang reference in view of the Dravida reference. The Examiner rejected Claims 3, 6, 7, 8, 11, 22, 23, 26, 28, 29, 32, and 33 under U.S.C. § 103(a) as being unpatentable over the Wang reference, the Dravida reference, and further in view of U.S. Pat. No. 6,611,522 issued in the name of Zheng et al. (hereinafter, the “Zheng reference”).

The Applicants respectfully offer remarks to traverse these pending rejections. The Applicants will address each independent claim separately as the Applicants believe that each independent claim is separately patentable over the prior art of record.

Independent Claim 1

The rejection of Claim 1 is respectfully traversed. It is respectfully submitted that the Wang, Dravida, and Zheng references fail to describe, teach, or suggest: (1) a laser transceiver node for receiving downstream packets; (2) a subscriber optical interface coupled to the laser transceiver node for (3) receiving downstream optical packets and (4) converting the downstream

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optical packets into an electrical domain to support services of a subscriber; wherein, the laser transceiver node further comprises: (5) a routing device for (6) directing downstream packets in an electrical domain to a plurality of multiplexers, (7) the routing device apportioning bandwidth in the electrical domain between subscribers and (8) using a look-up table for processing the downstream packets and upstream packets; (9) the plurality of multiplexers for receiving downstream packets from the routing device, wherein each multiplexer comprises (10) a final stage for controlling bandwidth of the downstream packets in the electrical domain relative to the subscriber optical interface, (11) the routing device determining which downstream packets are sent to a respective multiplexer, each multiplexer comprising: (12) a plurality of classifiers for determining type of information contained in a downstream packet and (13) for assigning a downstream packet to a particular policer, and (14) a plurality of policers for controlling bandwidth based upon a comparison between parameters assigned to each policer by a network provider and a downstream packet; and (15) laser transmitters coupled to the multiplexers, wherein (16) each multiplexer is coupled to and directly modulates a respective laser transmitter (17) for converting the downstream packets into an optical domain that are sent to a respective subscriber optical interface, as recited in amended independent Claim 1.

The Wang Reference

The Wang reference describes a wavelength access server 120 that comprises a wavelength access controller 204 in communication with a number of service specific transceivers 228J, 228K, 228L, 228M and 228N that send and receive data over service specific optical links to optical service network nodes 102 (not shown). The wavelength access controller 204 comprises a memory 210 and a processor 208 loaded with data communication apparatus operating software for executing the method of this invention from a software medium 212. The software medium 212 could be a disk, a tape, a chip or a random access memory containing a file downloaded from a remote source. The wavelength access controller 204 is also in bi-directional optical communication with the optical transport network element 110 (not shown) over a DWDM link 130. Wang reference, column 4, lines 22-36.

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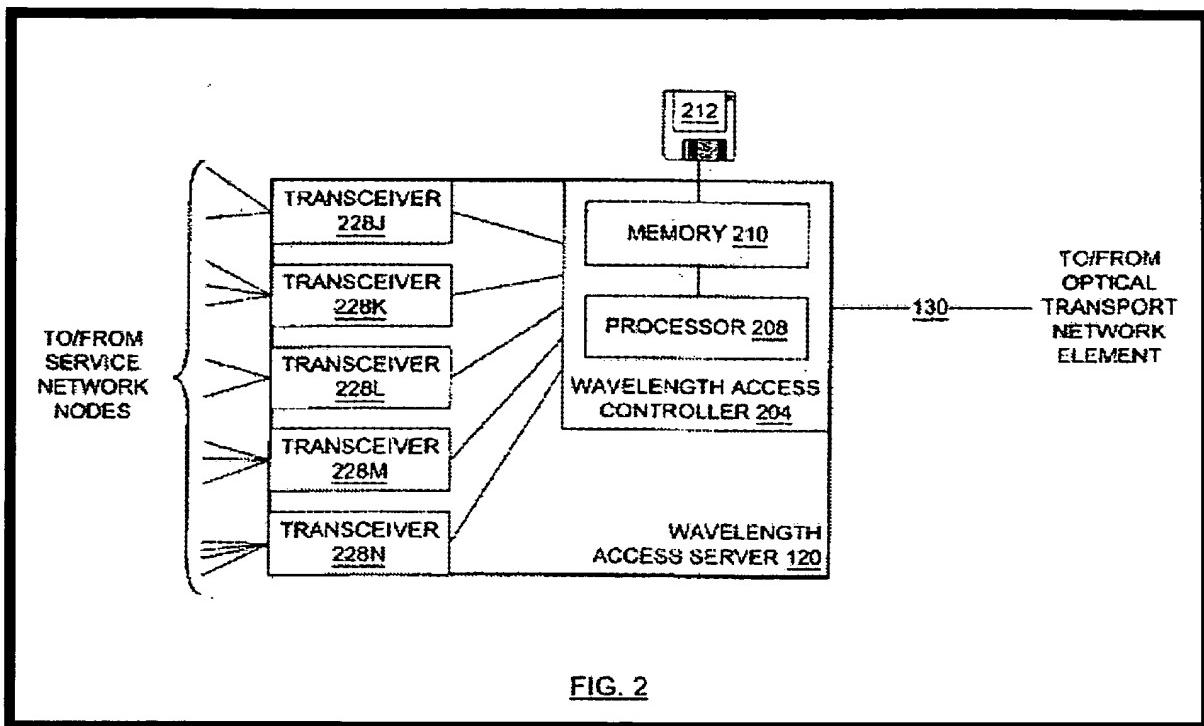


FIG. 2

Each transceiver 228 (illustrated in Figure 3 below) communicates with service network nodes 102 (not shown) via input/output (I/O) ports 340P, 340Q, 340R, 340S and 340T. Each I/O port 340 is in turn in communication with a service specific multiplexer-demultiplexer 342 that is in bi-directional electrical communication with the wavelength access controller 204 (FIG. 2). Wang reference, column 4, lines 37-44.

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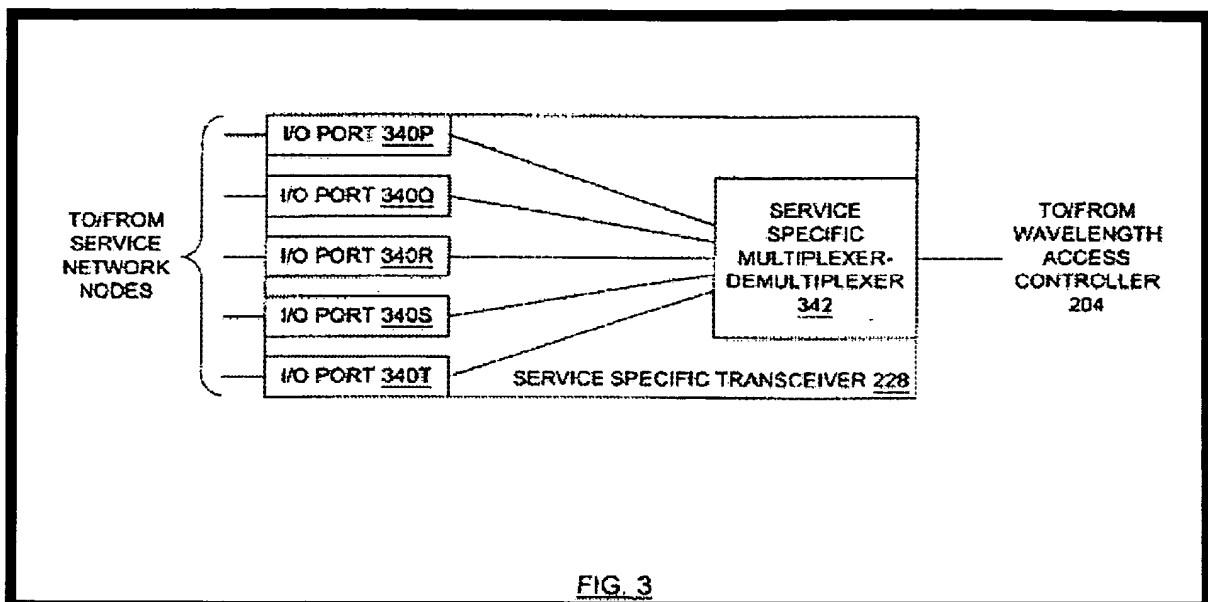


FIG. 3

In operation, within the local wavelength access server 120A a connection request may be communicated from a service specific transceiver 228 to the wavelength access controller 204 to request a path, for an aggregated traffic stream, to a service network node associated with the remote wavelength access server 120C. At the wavelength access controller 204, an optimal path through the optical transport network 100 to the remote wavelength access server 120C is determined. Wavelength channels along the determined path may then be provisioned through communication between the wavelength access controller 204 and the optical transport network element 110A and further communication from the optical transport network element 110A to the rest of the optical transport network 100. At the remote wavelength access server 120C, the aggregated traffic stream from the local wavelength access server 120A must be segmented such that traffic, specific to the service network node associated with the remote wavelength access server 120C, may be appropriately directed. Wang reference, column 4, lines 45-65.

Each wavelength access controller 204 within a respective wavelength access server 120 can perform optical interworking. Optical inter-working relates to converting (or mapping) the service specific electrical signals into corresponding service specific optical for transmission over wavelength channels in a DWDM link. The optical inter-working function may include a capability to add a "digital wrapper" to each service specific optical signal. Such a digital

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wrapper can add optical per-wavelength performance monitoring and error correction features to the service specific optical signal. The digital wrapper may take the form of a header similar to that used in SONET. For an example suitable digital wrapper, consider transmission of a 10 Gigabit Ethernet signal as payload in an OC-192 SONET signal. WaveWrapper technology, as defined by Lucent Technologies, provides a second example. Wang reference, column 6, lines 3-16.

The Examiner admits that the Wang reference fails to teach the following elements: a plurality of classifiers for determining type of information contained in a downstream packet and for assigning a downstream packet to a particular policer, and a plurality of policers for controlling bandwidth based upon a comparison between parameters assigned to each policer by a network provider and a downstream packet; and laser transmitters coupled to the multiplexers, wherein each multiplexer is coupled to and directly modulates a respective laser transmitter for converting the downstream packets into an optical domain.

In addition to not teaching the elements above, one of ordinary skill in the art recognizes that optical transceivers 228J-N convert electrical signals into optical signals which is not the same as apportioning bandwidth in the electrical domain between subscribers. Further, one of ordinary skill in the art recognizes that the wavelength access controller 204 of the Wang reference also does not apportion bandwidth in the electrical domain between subscribers and that it does not use a look-up table for processing downstream packets and upstream packets.

The Dravida Reference

To address the classifiers, policers, multiplexers, and interconnection deficiencies of the Wang reference, the Examiner relies on Figure 28 of the Dravida reference. Figure 28 of the Dravida reference (reproduced below) illustrates a traffic policing stage 1304 immediately following a packet classification stage 1302 in a network interface unit (NIU) for UPSTREAM PACKET FLOW. Dravida reference, paragraph [0044].

The traffic policing precedes the service specific packet processing stage 1306, which typically requires a significant amount of NIU processing capacity. This ordering ensures that the NIU processing capacity is not wasted on non-compliant packets that get dropped at the policing stage. Dravida reference, paragraph [0249].

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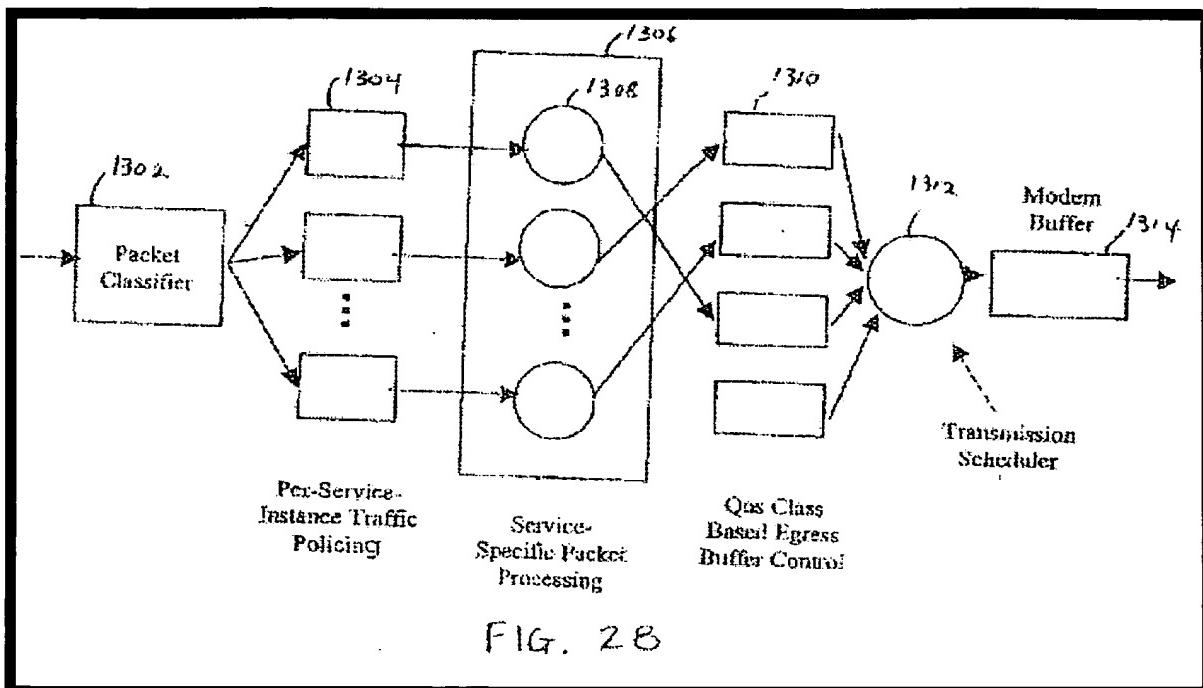


FIG. 28

For each service instance, there is a token bucket, which is characterized by two parameters: `token_size` and `max_burst_size` which respectively determine the average sustainable traffic rate and the largest traffic burst that the token bucket allows into the network. Dravida reference, paragraph [0250].

The NIU maintains a clock, which is used for updating the state of the token buckets for all service instances. the NIU also maintains a state variable, X, for each token bucket. At the end of each clock period of duration T ms, the NIU updates the state variable, X. Dravida reference, paragraph [0251]. Packet handling and token bucket updates are done independently, in an asynchronous manner. Whenever a packet is received by an NIU from its subscriber interface, it is passed through the packet classifier to identify its service instance. Once the service instance of a packet is identified, the packet is handed to the corresponding traffic police block 1304. The latter compares the length of the packet with the current value of its state variable X. If X is smaller than the packet length, the packet is dropped right away. Otherwise, it is passed on to the next stage (service specific processing 1306) based on its service instance, and the value of X is decremented by the packet length.

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As noted during the telephonic interview summarized above, the NIU of Figure 28 does not provide any teaching of a routing device. Figure 28 is conventional art that is mentioned in paragraph [0016] of the Applicants' published patent application. Figure 28 of the Dravida reference provides a system that polices data at the entry points (upstream direction) of a network. Meanwhile, Applicants' system polices data at the exit portions (downstream direction) of an optical network.

And like the Wang reference, the NIU of the Figure 28 of the Dravida reference does not have a routing device that apportions bandwidth in the electrical domain between subscribers and a look-up table for processing downstream packets and upstream packets.

The Zheng Reference

The Examiner admits that both the Wang and Dravida references, independently and in combination, do not provide any teaching of policers that control bandwidth with a weighted early random discard value that is assigned to a packet. To make up for this deficiency, the Examiner relies upon the Zheng reference.

The Zheng reference describes a switching shelf 12 that includes a housing 20 for containing the components of the switching shelf 12 that include eight line cards 22. The eight line cards 22 are printed circuit boards that contain circuitry for receiving and transmitting data. Each line card 22 is designed to receive an OC-48 input data stream, corresponding to 2.488 gigabits per second (Gbps). See Zheng reference, column 9, lines 30-40 and Figure 2 reproduced below.

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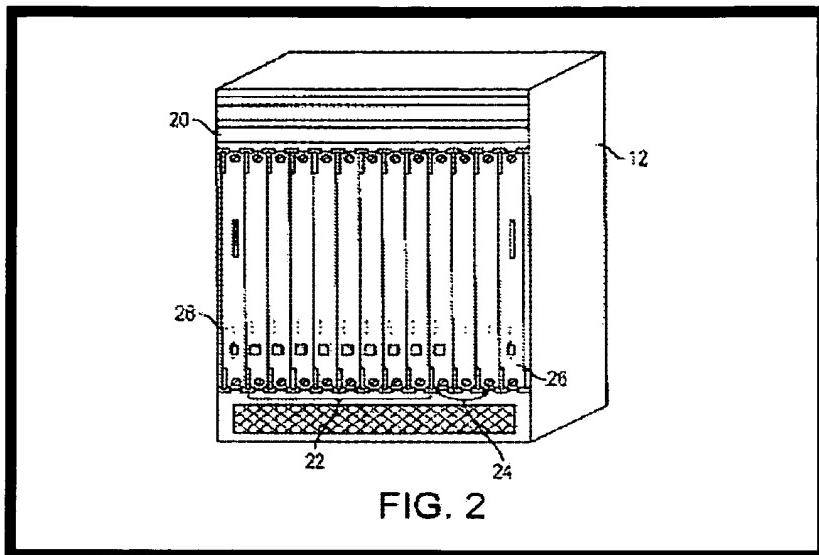
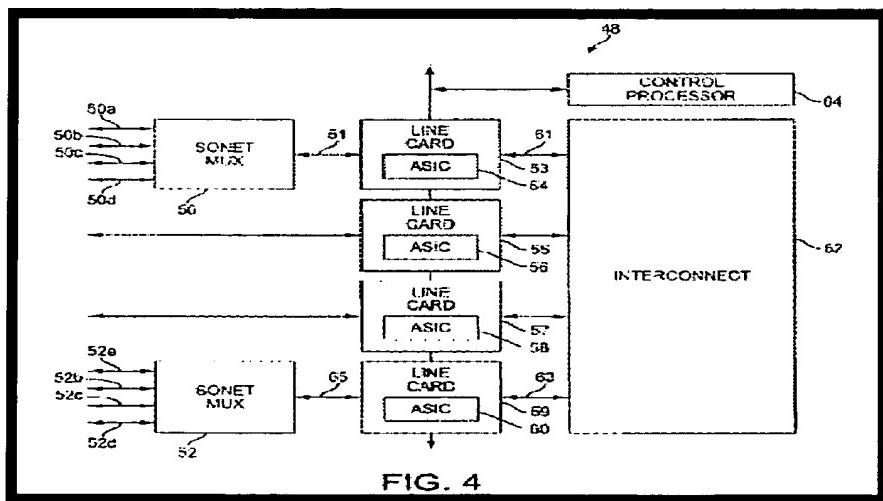


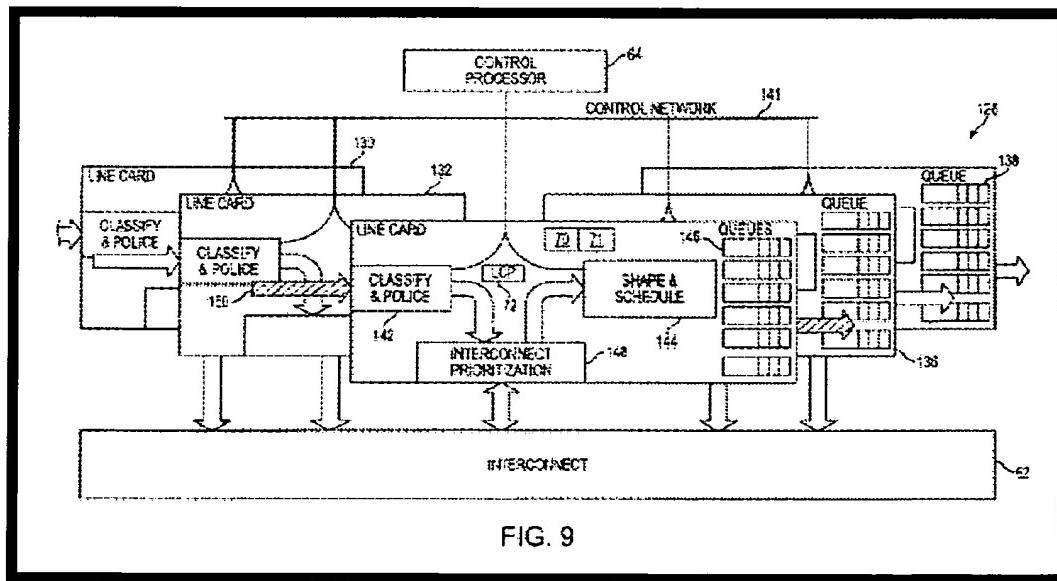
Figure 4 of the Zheng reference (reproduced below) illustrates four of the eight potential line cards 22 that can be included in a switching shelf 12. The block diagram 48 of FIG. 4 illustrates line cards 53, 55, 57 and 59, an interconnect 62, the SONET multiplexers 50 and 52, and a control processor 64. In operation, data enters a SONET multiplexer 50 by way of lines 52a-52d. The multiplexer 50 passes a single physical OC-48 data stream to the line card 59 by way of line 65.



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The line card 59 forwards information stripped from the OC-48 data stream to the interconnect 62, by way of line 63. The interconnect 62 processes the received information and forwards it to a destination line card, by way of example, line card 53, along line 61. The destination line card 53, in turn, transfers the received information by way of the OC-48 interface 51 to the SONET multiplexer 50. The multiplexer 50 forwards the received information to an external source by way of lines 50a-50d. Information transfers involving line cards 55 and 57 occur in much the same fashion. Zheng reference, column 10, lines 27-45 and Figure 4 reproduced above.

In Figure 9, the Zheng reference illustrates five line card modules 130-138 and the interconnect 62 in more detail. A control processor 64 is also depicted. A control network 141 electrically connects the line cards 130-138. Each line card 130-138 includes classification and policing elements 142, shaping, scheduling and congestion control elements 144, a queuing structure 146, prioritization elements 148, a line card processor (LCP) 72, a receive ASIC 70 and a transmit ASIC 71.



The line cards 130-138 of Figure 9 illustrated above receive data via input ports 150, classify and police 142 the data and send it to the interconnect 62. The prioritization elements 148 prioritize the data over the Interconnect to ensure that time critical data is delivered on time.

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The shaping, scheduling and congestion control elements 144 shape, schedule, and flow control data coming from the interconnect 62 according to the QoS of the data flow and congestion status, and places the data in an appropriate priority output queue 146 for transmission. See Zheng reference, column 17, lines 30-45.

While the Zheng reference may describe a random early detect (RED) function in column 4, lines 51-59, one of ordinary skill in the art recognizes that the Zheng reference does not use its classifying and policing elements 142 of Figure 9 as a final stage for controlling bandwidth of downstream packets in an electrical domain. Specifically, the Zheng reference does not provide any teaching of each multiplexer comprising a final stage for controlling bandwidth of the downstream packets in the electrical domain relative to the subscriber optical interface. Instead, like the Dravida reference, the Zheng reference uses classifiers and policers in an entrance or initial portion of a network for further processing in the electrical domain, such as further processing by interconnect 62 that is directly coupled to the classifying and policing elements 142.

Further, the Zheng reference does not provide any teaching of classifiers that assign a downstream packet to a particular policer. The Zheng reference also does not provide any teaching of a subscriber optical interface that receives optical packets from the laser transmitter and that converts the optical packets into the electrical domain to support services of a subscriber. The Zheng reference does not provide any teaching of laser transmitters coupled directly to multiplexers in which a multiplexer modulates a respective laser transmitter, as recited in amended independent Claim 1.

And this means that the Zheng reference also does not have a routing device for directing downstream packets in an electrical domain to a plurality of multiplexers, and the routing device apportioning bandwidth in the electrical domain between subscribers and using a look-up table for processing the downstream packets and upstream packets, as recited in amended independent Claim 1.

Conclusion for Independent Claim 1

In light of the differences between amended independent Claim 1 and the Wang, Dravida, and Zheng references, one of ordinary skill in the art recognizes that the broadest, reasonable interpretation of these references alone or in combination cannot anticipate or render obvious the

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recitations as set forth in amended independent Claim 1. Accordingly, reconsideration and withdrawal of this rejection of Claim 1 are respectfully requested.

Independent Claim 13

The rejection of Claim 13 is respectfully traversed. It is respectfully submitted that the Wang, Dravida, and Zheng references fail to describe, teach, or suggest: (1) receiving downstream packets with a laser transceiver node comprising (2) an exit portion of an optical network; (3) at the exit portion of the optical network: (4) apportioning bandwidth in an electrical domain between subscribers with a routing device; (5) using a look-up table in the routing device for (6) processing a downstream packet to determine its downstream destination; (7) classifying a downstream packet by evaluating a header of the packet; (8) determining if the downstream packet matches at least one of rate and size parameters; (9) assigning one of two priority values to the downstream packet (10) based upon the determination if the downstream packet matches one of rate and size parameters; (11) determining whether to store the downstream packet in one of a plurality of buffers (12) based upon a weighted random early discard function that employs one of the priority values; (13) receiving the downstream packet directly from an output buffer with a laser transmitter; (14) modulating the laser transmitter with the downstream packet; (15) receiving the downstream optical packet with a subscriber optical interface coupled to the laser transceiver node; and (16) converting the downstream optical packet into an electrical domain with the subscriber optical interface to support services of a subscriber, as recited in amended independent Claim 13.

Similar to the arguments presented above regarding independent Claim 1, the three references do not teach apportioning bandwidth in an electrical domain between subscribers with a routing device and using a look-up table in the routing device. The references also do not teach all of these elements for an exit portion of an optical network.

In light of the differences between independent Claim 13 and the Wang, Dravida, and Zheng references, one of ordinary skill in the art recognizes that that these references alone or in combination cannot anticipate or render obvious the recitations as set forth in amended independent Claim 13. Accordingly, reconsideration and withdrawal of the rejection of Claim 13 are respectfully requested.

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Independent Claim 25

The rejection of Claim 25 is respectfully traversed. It is respectfully submitted that the Wang, Dravida, and Zheng references fail to describe, teach, or suggest: (1) an optical network comprising: (2) a data service hub for generating downstream data packets; (3) a transceiver node coupled to the data service hub and comprising (4) an exit path relative to the data service hub (5) for receiving and processing the downstream data packets, the transceiver node further comprising: (6) a routing device for directing the downstream data packets in an electrical domain to a plurality of multiplexers, (7) the routing device apportioning bandwidth in the electrical domain between subscribers and (8) using a look-up table for processing the downstream packets and upstream packets; (9) the plurality of multiplexers for receiving downstream packets from the routing device, (10) wherein each multiplexer comprises a final stage for controlling bandwidth of the downstream packets in an electrical domain relative to a subscriber optical interface, (11) the routing device determining which downstream packets are sent to a respective multiplexer, each multiplexer comprising: (12) a plurality of classifiers for determining type of information contained in a downstream packet, and (13) a plurality of policers for controlling bandwidth by one of (14a) discarding packets and (14b) assigning one of two priority values to a downstream packet; (15) a plurality of buffers for receiving downstream packets from the policers; (16) a laser transmitter coupled directly to the buffers for propagating the downstream packets over an optical waveguide; (17) an optical tap coupled to the optical waveguide; and (18) the subscriber optical interface coupled to the optical tap for converting the downstream packets from an optical domain into an electrical domain that support services of a subscriber, as recited in amended independent Claim 25.

Similar to the arguments presented above regarding independent Claim 1, the three references do not teach a routing device apportioning bandwidth in the electrical domain between subscribers and using a look-up table for processing the downstream packets and upstream packets. The references also do not teach all of this processing for an exit path of a network.

In light of the differences between independent Claim 25 and the Wang, Dravida, and Zheng references, one of ordinary skill in the art recognizes that that these references alone or in combination cannot anticipate or render obvious the recitations as set forth in amended

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independent Claim 25. Accordingly, reconsideration and withdrawal of the rejection of Claim 25 are respectfully requested.

Independent Claim 30

The rejection of Claim 30 is respectfully traversed. It is respectfully submitted that the Wang, Dravida, and Zheng references fail to describe, teach, or suggest: (1) forming exit pathways of the optical network within a laser transceiver node; (2) apportioning bandwidth in an electrical domain between subscribers with a routing device (3) that is part of the laser transceiver node; (4) using a look-up table with the routing device for processing downstream packets to determine downstream destinations; (5) positioning a plurality of classifiers and policers at directly adjacent to the exit pathways of the optical network, (6) each exit pathway comprising a laser transmitter and an optical waveguide; (7) discarding downstream packets in an electrical domain with the policers if they exceed a peak rate; (8) assigning one of at least two priority values to each downstream packet with the policers; (9) controlling downstream data packet egress from the network in an electrical domain (10) at a position directly adjacent to the exit pathways (11) by evaluating the priority values with the policers; (12) receiving downstream data packets from the policers with a laser transmitter; (13) converting the downstream data packets into an optical domain with the laser transmitter; (14) propagating the downstream optical data packets over an optical waveguide; (15) receiving the downstream optical data packets with a subscriber optical interface; and (16) converting the downstream optical data packets into an electrical domain with the subscriber optical interface for supporting services of a subscriber, as recited in amended independent Claim 30.

Similar to the arguments presented above regarding independent Claim 1, the three references do not teach apportioning bandwidth in an electrical domain between subscribers with a routing device that is part of the laser transceiver node and using a look-up table with the routing device for processing downstream packets to determine downstream destinations. The three references also do not teach forming exit pathways for an optical network with the elements discussed above.

In light of the differences between independent Claim 30 and the Wang, Dravida, and Zheng references, one of ordinary skill in the art recognizes that that these references alone or in combination cannot anticipate or render obvious the recitations as set forth in amended

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independent Claim 30. Accordingly, reconsideration and withdrawal of this rejection of independent Claim 30 are respectfully requested.

Dependent Claims 2-12, 14-24, 26-29, and 31-33

The Applicants respectfully submit that the above-identified dependent claims are allowable because the independent claims from which they depend are patentable over the cited references. The Applicants also respectfully submit that the recitations of these dependent claims are of patentable significance.

In view of the foregoing, the Applicants respectfully request that the Examiner withdraw the pending rejections of dependent Claims 2-12, 14-24, 26-29, and 31-33.

CONCLUSION

The foregoing is submitted as a full and complete response to the Non-Final Office Action mailed on September 8, 2006. The Applicants and the undersigned thank Examiner Bello for consideration of these remarks. The Applicants have amended the claims and have submitted remarks to traverse rejections of Claims 1-33. The Applicants respectfully submit that the present application is in condition for allowance. Such action is hereby courteously solicited.

If the Examiner believes that there are any issues that can be resolved by a telephone conference, or that there are any formalities that can be corrected by an Examiner's amendment, please contact the undersigned in the Atlanta Metropolitan area (404) 572-2884.

Respectfully submitted,

/SPW/

Steven P. Wigmore
Reg. No. 40,447

King & Spalding LLP
191 Peachtree Street, N.E.
Atlanta, Georgia 30303-1763
telephone: (404) 572.4600
K&S File No. 08286-105004